Grant Proposal: Investing in Demand and Financial Constraints: Evidence from Alibaba's Taobao

It is well understood that the positive relation between firm growth and profitability does not depend on physical or technological efficiency alone. Within-industry dispersion in customer base and output prices due to, for example, geographic demand variations or long-term relationships between consumers and producers, can be as important in determining firm growth. In fact, evidence reported in Foster, Haltiwanger, and Syverson (2008) suggests that idiosyncratic demand shifts or market power variations could be the *dominant* determinant of firm survival even in markets for homogeneous goods.

Demand constraints appear the most severe for new entrepreneurs. Foster, Haltiwanger, and Syverson (2016) and Ferraz, Finan, and Szerman (2015) have shown that young firms close the size gap to established competitors only very slowly even though they are often as or even more productive than large firms. As a result, demand-side fundamentals impede the reallocation of market share towards better entrepreneurs. From a welfare perspective, it is important to study the frictions that allow such within-industry dispersion in demand to persist. Yet, the literature reports surprisingly little empirical evidence regarding these frictions.

We hypothesize that financial constraints are partly responsible for persistent within-industry dispersion in demand. Young and small firms without access to capital markets or syndicated loans lack funds to invest in advertisement and customer relations, which is intangible and can not be pledged as collaterals.[1] This project aims to establish a *causal* effect of financial constraints on investment in demand-related expenditures. Specifically, we study the impact of access to micro-credit on advertising expenditures of roughly 30 million shops selling on Alibabas trading platform Taobao during the period September 2014 to July 2016. Our identification strategy exploits discontinuities in shops' access to financing from Alibaba's FinTech branch *Ant Financial*. Ant Financial provides micro-credit to young entrepreneurs on Alibaba's online platform Taobao based on an automated algorithm. The credit decision depends, to a large extent, on the seller's credit score which must exceed a fixed threshold. This rule generates a clear discontinuity in entrepreneurs' access to micro-credit (see Figure 1).

The discontinuity in access to micro-credit allows us to show how random variation in financial constraints (random around the credit score threshold of 480) is associated with significant changes in demand-related expenditures of Taobao-shops. Columns 2 to 5 of Table 1 show the second stage of a fuzzy regression discontinuity estimation (RDD) for different outcome variables. The regressor of interest *Credit Approval* is instrumented by a binary variable that equals one if the shop's credit score exceeds 480. Consistent with our prediction, a relaxation of financial constraints (credit approval) causes an increase in the fraction of products for which the shop pays an advertisement fee (column 2) and in the absolute number of advertised products (column 3). In column 4, we observe that more orders are placed after a customer clicks on an advertisement link. Overall, these preliminary results suggest that financial constraints can, at least in part, explain why young small firms underinvest in demand-related expenditures.

Our rich data will allow us to push the analysis further. Besides the outcome variables in Table 1, we can also observe how much revenue is generated from orders that are placed after customers click on advertisement links as well as the average sales price (albeit the average price of all products—whether advertised or not). Hence, we can also study the return on advertisement and show how credit access accelerates sales growth. Further, our data allows us to observe changes in reputation after (random) changes in access to loan financing. Specifically, we measure the evolution of reputation based on each seller's overall shop rating as well as his different delivery, service, and product evaluation scores. Hence, we are able to study whether

[1] For instance, the survey by Campello, Graham, and Harvey (2010) shows that financially constrained firms in the U.S. planned to reduce marketing expenditures by, on average, 33% in 2008. This dramatic cut exceeds the (planned) cuts of 22% and 9% to technology spending and capital investment. In contrast, financially unconstrained firms planned to cut marketing expenditures by only 4.5% and would rather cut tech expenditures.

Table 1: Credit approval and advertisement (fuzzy RDD)
This table reports coefficient estimates from fuzzy RDD estimation. Column 1 shows the first stage with the dependent variable *Credit Approval* which equals one if the Taobao-shop is given access to credit from Ant Financial and zero otherwise. *Credit Approval* is regressed on an indicator variable which equals one if the shop's credit score exceeds 480. Columns 2 to 4 show second stages for different outcome variables: *% Advertised Products* (= fraction of products that are advertised), *Log Number of Advertised Products*, and *Log Number of Advertised Orders* (= natural log of orders that customers place after clicking on an advertisement link). The sample is restricted to firms with a credit score between 460 and 500. We include 3rd order polynomial terms of the credit score as controls. t-statistics are reported in parentheses and significance at the 10%, 5%, and 1% level is indicated by *, **, ***, respectively.

Dependent variable:	First stage	Second stage		
	Credit Approval (1)	*% Advertised Products* (2)	*Log # Advertised Products* (3)	*Log # Advertised Orders* (4)
Dummy: *Credit Score* > 480	0.255*** (121.403)			
Dummy: *Credit Approval (instrumented)*		0.038*** (14.184)	0.395*** (19.431)	0.964*** (22.641)
Polynomials of *Credit score* (3rd order):	Yes	Yes	Yes	Yes
Observations	1,128,735	1,128,735	1,128,735	1,128,735

access to financing leads firms to invest into reputation and signal its fundamental quality.[2] As the data also report the number of transient versus loyal customers (which buy from the same shop repeatedly), we can also test whether investment into reputation and advertisement translates into the formation of long-term customer relationships.

We plan to use this data and the quasi-random variation of *Ant Financial* to inform a model of reputation formation and firm dynamics for new entrepreneurship growth. Young firms need to invest in advertisement to improve the chance of being matched with a potential customer, who does not observe the true quality /efficiency of the firms. A successful transaction will improve the reputation of the firm and help it to attract future customers. On the other hand, if the new entrepreneur is financially constrained, he/she will have very limited resources for advertisement and relationship building. The low visibility will amplify the information asymmetry problem, substantially slowing down the growth of the firm even if its true quality/efficiency is high. Our unique data allows us to quantify these theoretical channels and investigate the extent of misallocation in this important E-commerce setting.

Budget:

- Our project will require us to work with a massive dataset at Alibaba's head-quarter. We are requesting the resource to hire a full time research assistant, who will work with the data on-site and generate the necessary data descriptives and statistical regressions as inputs to our empirical analysis. The RA's salary and fringe for two semesters is $15,000.
- The PIs will also need to travel to China to do interviews with small online entrepreneurs and the administrators at Alibaba as well as Ant Financial. We are requesting $5,000 for the PIs' international travel.

[2] Bar-Isaac and Tadelis (2008) stress the importance for precise knowledge about buyers' information sets for empirical research on reputation formation. Our setting offers important advantages in this regard as the information available to buyers is limited to what is communicated on the shop page on Taobao. In particular, customers do not observe whether a seller has received access to loan financing from Ant Finance. We are not the only paper to study reputation formation in online trading markets. Cabral and Hortacsu (2010) study how changes in reputation affect buyers and sellers' actions on eBay. They show that, when a seller first receives negative feedback, sales decrease and he receives more subsequent negative feedback ratings. Sellers are more likely to exit the lower their reputation. More references to empirical papers on the role of reputation in online trading markets are found in Tadelis (2016).

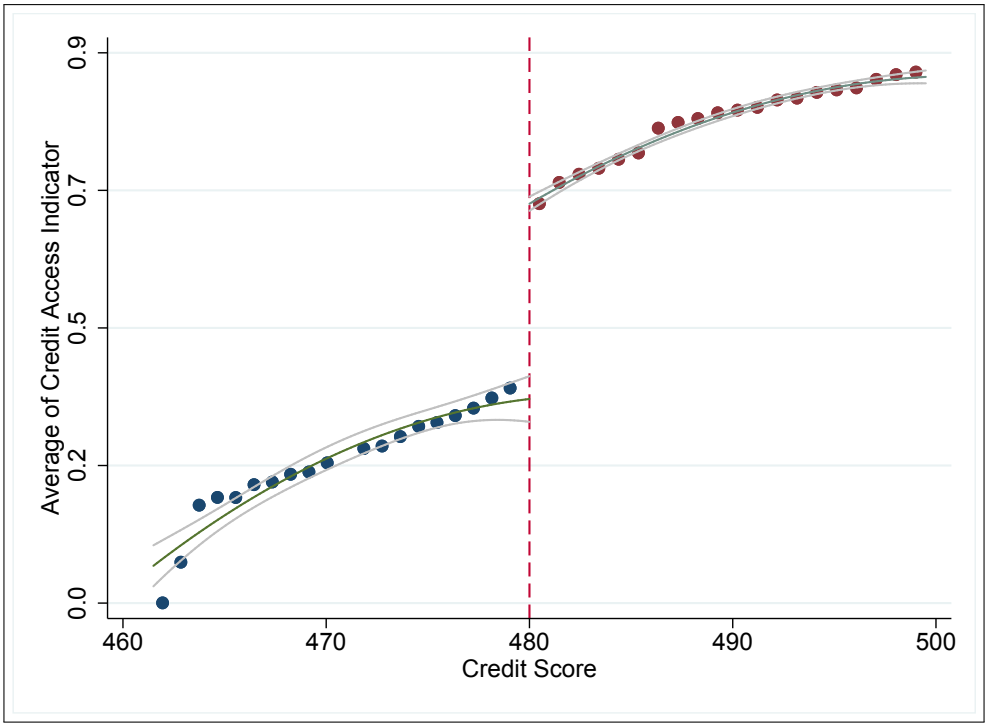


Figure 1: This figure plots the percentage share of shops on Alibaba's online platform Taobao which become credit eligible as a function of their credit score. The bin size is one credit score unit and the curved line a third order polynomial $f(CS_{i,t})$ fitted to the probability distribution on both sides of the discontinuity at the credit score of 480.

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